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CHROMOSOME RACES IN THE CHRYSANTHEMUM LEUCANTHEMUM COMPLEX[1]

Gerald A. Mulligan[2]

In 1954, as the result of chromosome studies on Canadian weeds, the presence of two chromosome races in North American material of *Chrysanthemum leucanthemum* L. s.l., oxeye daisy, was detected. Subsequent study revealed that the abundant and widespread oxeye daisy of North America is diploid with 18 somatic chromosomes. Tetraploid plants do occur on this continent but the occurrences are not widespread.

I determined the number of chromosomes in 36 lots of material from different locations in Nfld., Lab., P.E.I., N.S., N.B., Que., Ont., B.C., and Me. A somatic number of 18 was determined on 32 lots of this material and the other 4 lots had 36 somatic chromosomes. The tetraploid plants were grown from seed collected at Batiscan, Lauzon and Lennoxville in the Province of Quebec and at Tidehead, New Brunswick. Cooper and Mahony (1935) counted 18 meiotic chromosomes on material from the campus of the University of Wisconsin and Martin and Smith (1955) counted 18 somatic chromosomes in material from Corvallis, Oregon. Three chromosome races of *C. leucanthemum* L. s.l., with somatic chromosome numbers of 18, 36 and 54, occur in Europe. I counted 36 chromosomes on material received from France and the U.S.S.R. and 54 mitotic chromosomes on two lots of material from Portugal. Other counts on European material were made by Polya (1950) on diploid plants and Negodi (1937), Ohrt in Tischler (1950) and Löve and Löve (1956) on tetraploid plants. Dowrick (1952) and Böcher and Larsen (1957) obtained somatic counts of 18, 36 and 54 on European material. Three tetraploid counts

[1] Contribution No. 1607 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.
[2] Assistant Botanist (Weed Investigations).

were obtained on Japanese material by Tahara (1915), (1921) and Shimotomai (1937).

The maximal inner width of pollen grains of the diploid, tetraploid and hexaploid plants counted was measured[3] and a correlation was found to exist between size of pollen grains and chromosome numbers. The pollen grains of diploid plants ranged from 16.3μ to 19.5μ, tetraploids from 19.5μ to 22.8μ and hexaploids from 22.8μ to 24.4μ. Pollen grains from 191 Canadian and United States herbarium specimens were measured. None of these specimens had pollen grains in the hexaploid size range. A total of 162 herbarium specimens collected in Nfld., Lab., N.S., P.E.I., N.B., Que., Ont., Man., Sask., Alta., B.C., Mass., Vt., N.Y., Va., W.Va., Mich., Minn., Colo., Mont., Ida., Wash., Nev., and Calif. had pollen grains in the diploid size range. The remaining 29 sheets had pollen grains that fell within the tetraploid size range. A total of 17 of these "tetraploids" had been collected in the area between Quebec City and Gaspé or in the vicinity of Granville and Digby, Nova Scotia. The other 12 herbarium sheets with tetraploid-size pollen grains were collected from other locations in Lab., Que., Ont., Man., B.C., Minn., and Wash. The inner diameters of pollen grains from 15 European herbarium specimens were examined and 12 sheets had pollen grains in the tetraploid size range, 2 in the diploid range and 1 in the hexaploid range.

It appears, from chromosome counts and pollen data, that most of the North American plants of *C. leucanthemum* L. s.l. are diploid although a small amount of our material is tetraploid. In Europe, the common *C. leucanthemum* L. s.l. is not diploid but tetraploid. Diploid plants seem to be slightly less common than tetraploids in Europe and hexaploids are rare. Dowrick in personal correspondence, dated December 2nd 1955, wrote: "Of the European *C. leucanthemum* plants which I have counted $2n = 36$ is by far the most frequent number. The $2n = 54$ plants came from Switzerland and the *one* count of $2n = 18$ from plants obtained from Ireland." Böcher and Larsen (1957) counted 26 lots of plants from 10 European countries and 9 lots were diploid, 16 tetraploid and 1 lot hexaploid.

The morphological differences between my diploids and tetraploids are similar to those given by Fernald (1903) when he de-

[3] Pollen was removed from open disk florets and stained with cotton blue in lacto-phenol. Only well stained pollen showing three open pores were measured.

scribed the characters differentiating his *Chrysanthemum leucanthemum* L. var. *subpinnatifidum* from what he considered the typical *C. leucanthemum* L. He recognized that the common ox-eye daisy of North America had in general a uniformly different type of foliage from the common plant of Europe and named the common North American plant var. *subpinnatifidum*. Fernald's variety has the characters of my diploid plants; the basal leaves generally coarsely and irregularly toothed and the middle and upper leaves usually narrowly oblong or oblanceolate, conspicuously subpinnatifid at the base. The characters he gave for the plant that is localized in North America and most common in Europe, the so called *C. leucanthemum* L., correspond to the morphological characters found in my tetraploids. The basal leaves are usually spatulate-obovate and closely and regularly crenate and the middle and upper leaves are usually oblong or oblanceolate, coarsely crenate or dentate above with larger spreading teeth at the base.

Böcher and Larsen (1957) examined the type specimen of *Chrysanthemum leucanthemum* L. in the British Museum. This plant although lacking stem leaves had diploid size pollen grains and was considered by the authors to be morphologically similar to their diploid plants. They include in their paper an excellent photograph of a diploid plant originally collected at Edenderry, Eire. This photograph and their description of the European diploids convince me that their diploids are morphologically indistinguishable from my diploids and the common oxeye daisy of North America. It can be concluded that our common oxeye daisy is *Chrysanthemum leucanthemum* L. s. str. Böcher and Larsen believe that European tetraploid plants should be placed in *Chrysanthemum ircutianum* Turcz. s.l. From the photographs and description in their paper it is evident that our North American tetraploids are very similar in morphology to their tetraploids. Unless the size of pollen grains is known, it is often impossible to positively identify tetraploids on anything but a complete herbarium specimen. Therefore, it appears premature to regard the tetraploids as a separate species.

In summary, the common oxeye daisy of North America has a somatic chromosome number of 18 and appears to be the typical *Chrysanthemum leucanthemum* L. s. str. Plants with a somatic number of 36 also occur on this continent but the stands are rela-

tively few and localized. Plants with somatic numbers of 18, 36 and 54 occur in Europe; the tetraploid plants are somewhat commoner than the diploids and hexaploids are rare.

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NOTES ON THE DISTRIBUTION OF OHIO COMPOSITAE: I. HELIANTHEAE, ANTHEMIDEAE[1]

Robert W. Long

This series of observations was made during the preparation of "A Preliminary List of the Compositae of Ohio."[2] The plants named below are those whose occurrence in Ohio is poorly understood judging from the information given in Gray's Manual (1950) and The New Britton and Brown Illustrated Flora (1952). Most of these plants were introduced into Ohio as weeds either from Europe or from western states. This illustrates, however, the

[1] This study was aided in part by a grant from the Ohio Academy of Science.

[2] Long, Robert W. (1957) A preliminary list of the Compositae of Ohio. The Ohio Flora Comm., Ohio State University, Columbus, Ohio.